TOPCON

# REPAIR MANUAL

ISSUED..... AUG. 2003
REVISED .....

**SLIT LAMP**

# SL-D7

**TOPCON CORPORATION**

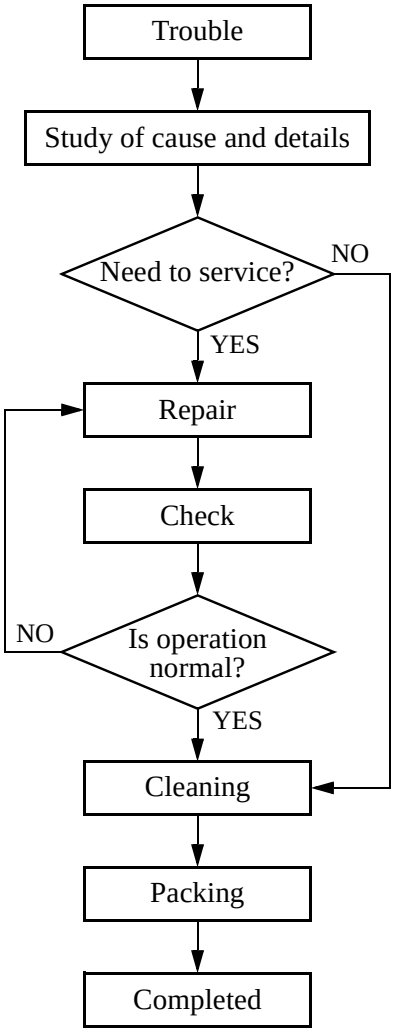
R-SLD7-0-0308-11

# CONTENTS

# 1. INTRODUCTION

## 1-1 How to Use This Repair Manual

(1) Follow the procedure described in the flowchart below.

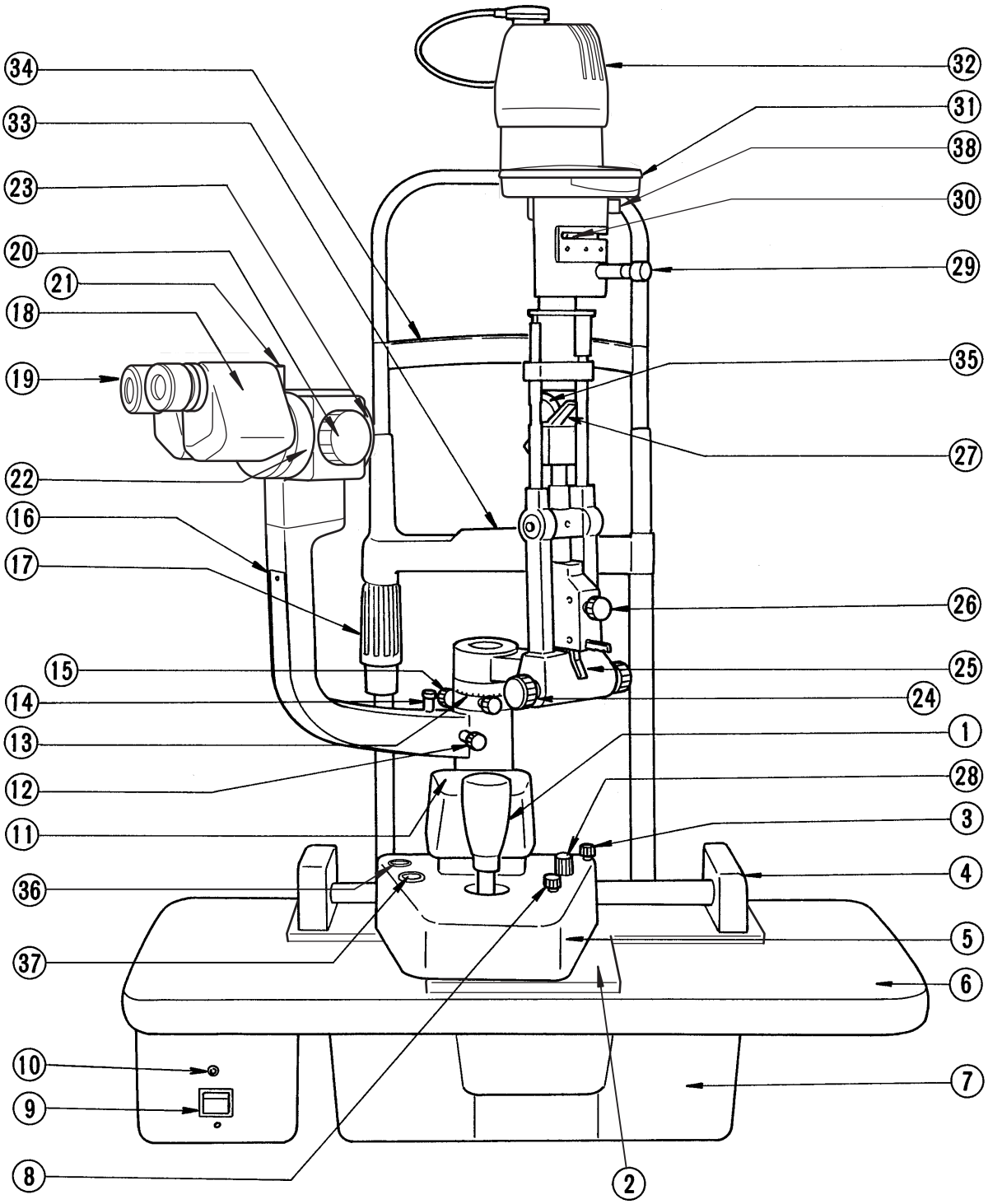


## 1-2 Precautions for Repairs

(1) Disassemble, assemble, repair or adjust the optical system in the clean area where no dust or foreign matter will affect the instrument.
(2) For assembly and inspection, refer to the assembly and instruction manual of SL-D7.
(3) When repairing this instrument, use proper materials and tools correctly according to this manual.
(4) As a rule, a metallic part should be replaced as a single part and an optical part as a unit in this manual.
(5) Refer to the service parts list for the disassembly or assembly of the component not mentioned in this manual.
(6) Don’t use other lubricating oils or adhesives except those specified.
(7) Order repair parts according to the service parts list.

## 1-3 Nomenclature

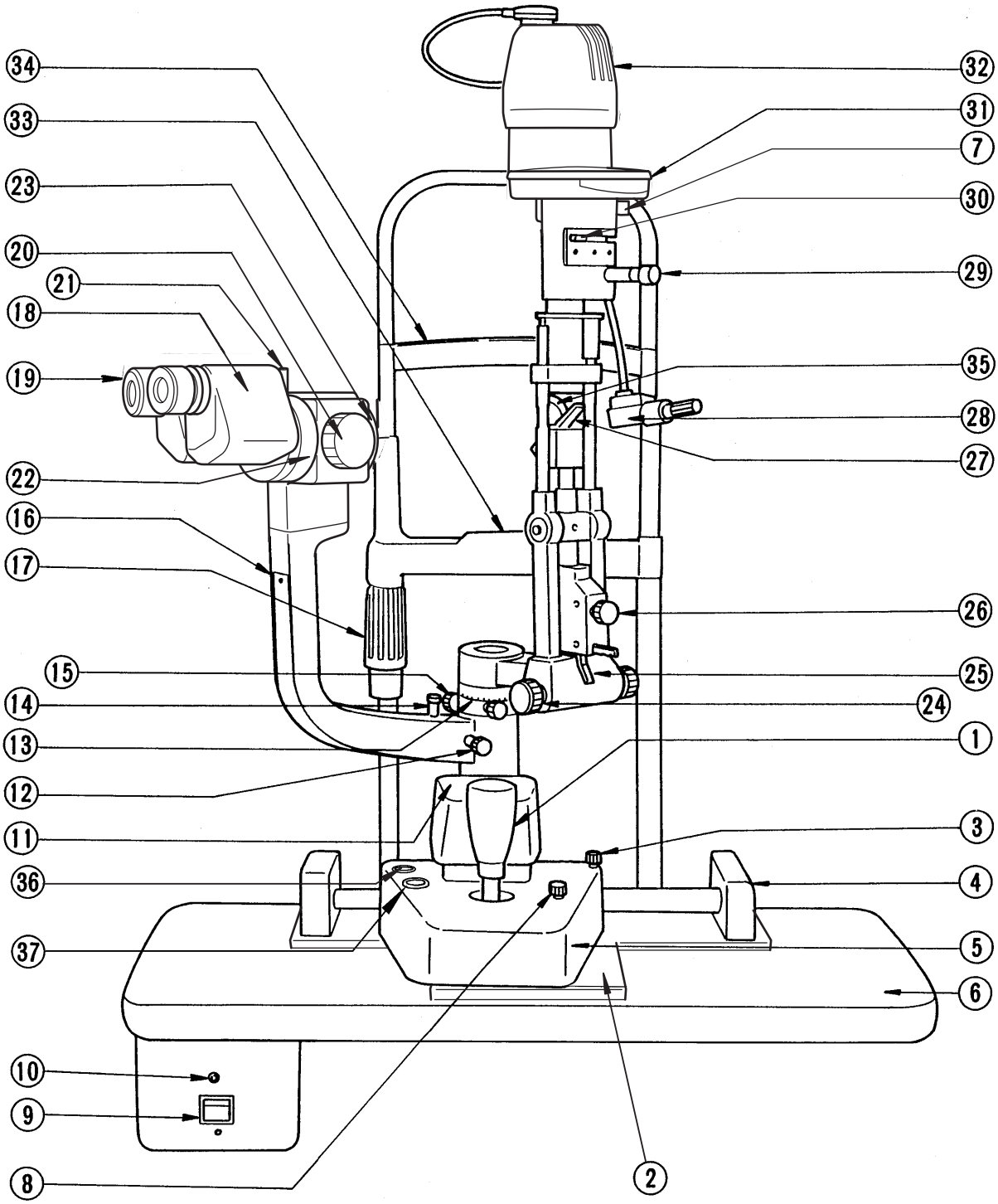
**For Japan**



① Control lever
② Chin rest base plate
③ Cross slide fixing knob
④ Rail cover
⑤ Cross slide
⑥ Table
⑦ Accessory drawer
⑧ Brightness control dial
⑨ Power switch
⑩ Pilot lamp
⑪ Up-and-down balance spring
⑫ Microscope arm fixing knob
⑬ Angle scale
⑭ Click stop roller
⑮ Illumination arm fixing knob
⑯ Arm cover
⑰ Chin rest up-and-down handle
⑱ Eyepiece
⑲ 12.5× eyepiece (with click)
⑳ Magnification change handle
㉑ Eyepiece tightening knob
㉒ Barrier filter unit
㉓ Objective lens
㉔ Slit width adjusting handle
㉕ Inclination stop lever
㉖ Centering knob
㉗ Mirror
㉘ R/L lock switch
㉙ Aperture/slit change handle
㉚ Filter selection lever
㉛ Aperture/slit display window
㉜ Lamp house cover
㉝ Chin rest
㉞ Forehead rest
㉟ Diffusion lens
㊱ Connector for light adjustment (5P)
㊲ Connector for image taking-in operation (8P)
㊳ Color temperature conversion filter

**Note: Refer to the instruction manual for the functions.**

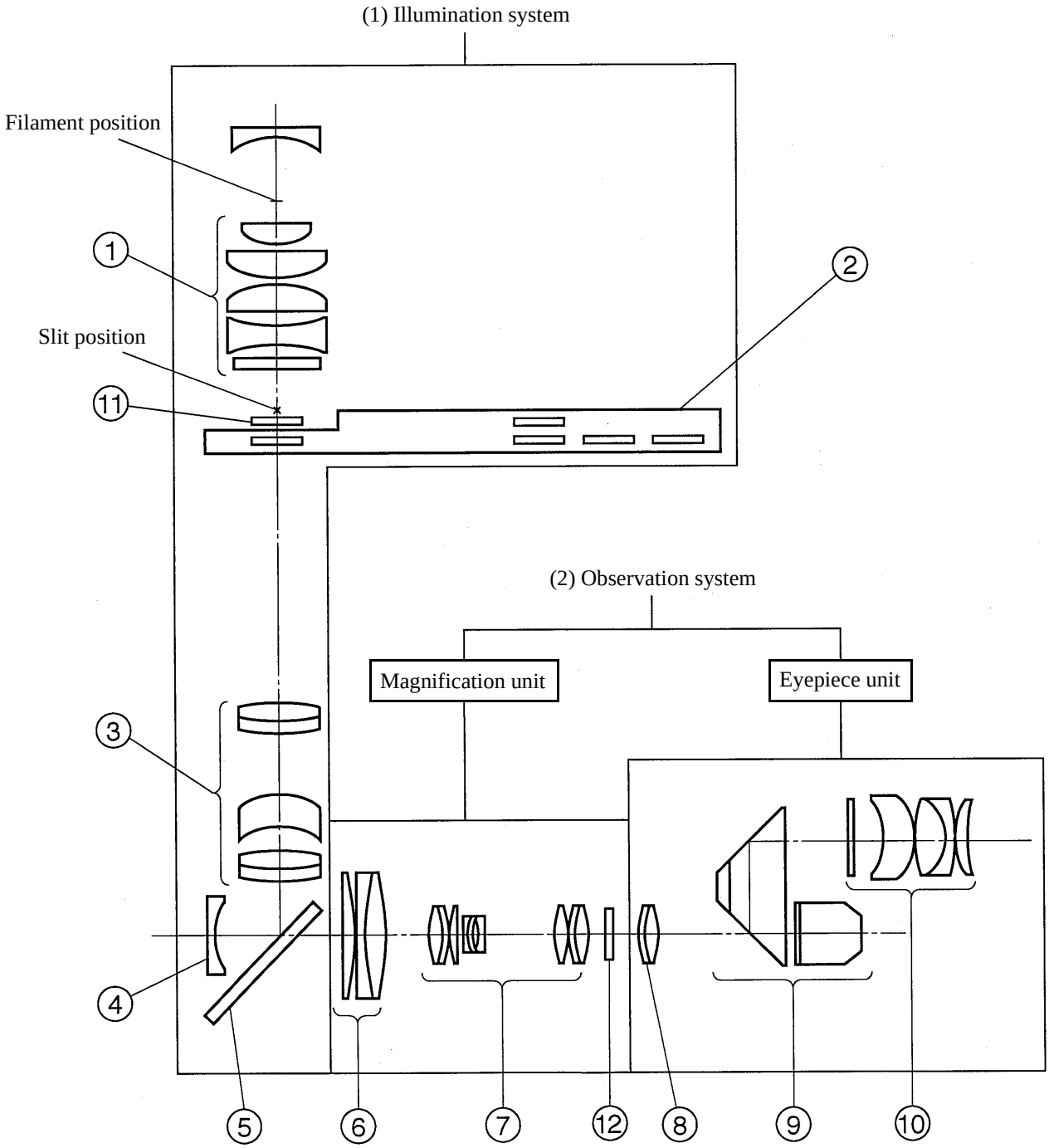
**For TMS, TE, TS and General**



① Control lever
② Chin rest base plate
③ Cross slide fixing knob
④ Rail cover
⑤ Cross slide
⑥ Table
⑦ Color temperature conversion filter
⑧ Brightness control dial
⑨ Power switch
⑩ Pilot lamp
⑪ Up-and-down balance spring
⑫ Microscope arm fixing knob
⑬ Angle scale
⑭ Click stop roller
⑮ Illumination arm fixing knob
⑯ Arm cover
⑰ Chin rest up-and-down handle
⑱ Eyepiece
⑲ 12.5× eyepiece (with click)
⑳ Magnification change handle
㉑ Eyepiece tightening knob
㉒ Barrier filter unit (depending on destination, TE)
㉓ Objective lens
㉔ Slit width adjusting handle
㉕ Inclination stop lever
㉖ Centering knob
㉗ Mirror
㉘ Fixation target
㉙ Aperture/slit change handle
㉚ Filter selection lever
㉛ Aperture/slit display window
㉜ Lamp house cover
㉝ Chin rest
㉞ Forehead rest
㉟ Diffusion lens
㊱ Connector for optical adjustment (5P)
㊲ Connector for image taking-in operation (8P)

**Note: Refer to the instruction manual for the functions.**

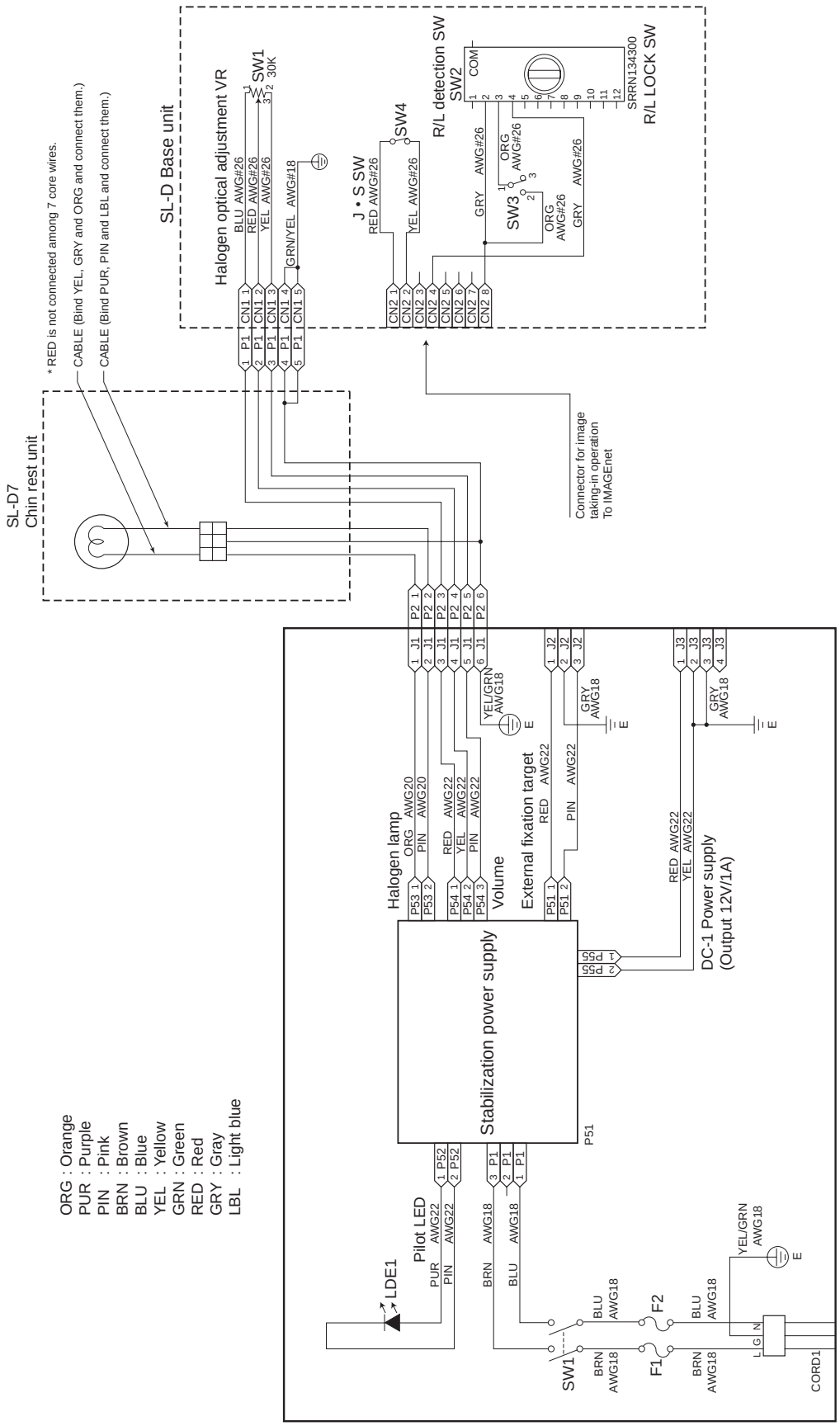
## 1-4 Optical Arrangement



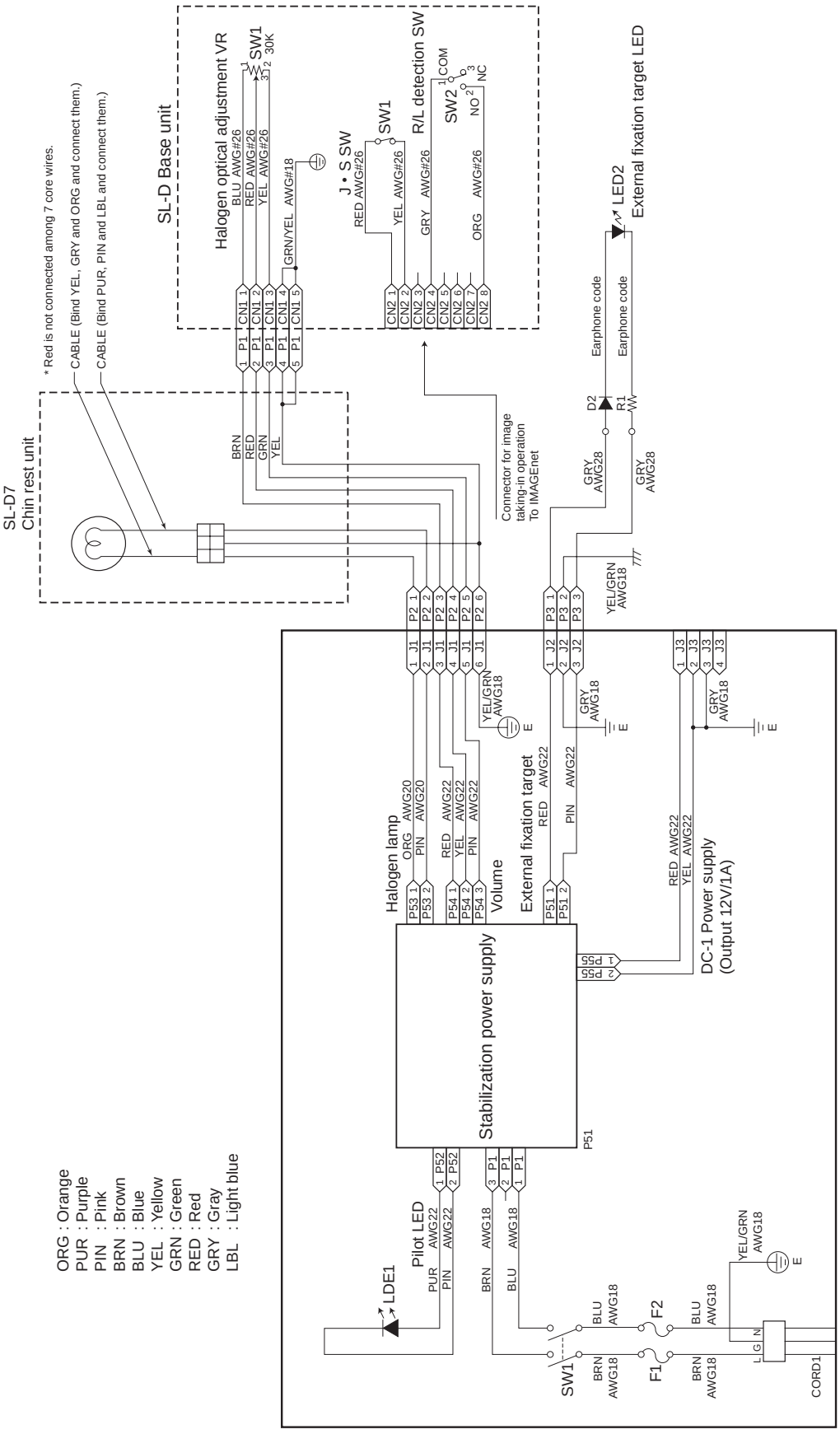
| Names of optical units | Functions |
|---|---|
| ① Condenser lens | Adjusts the condensing position for the main bulb filament. |
| ② Filter | Selects the blue, red-free, ND, heat absorbing, UV cut, IR cut or exciter filter according to the clinical purpose. |
| ③ Projection lens | Projects and focuses the slit image. |
| ④ Diffusion lens | Widens the illumination field when photographing the anterior eye section. |
| ⑤ Reflection mirror | Reflects the slit image to project it into the anterior eye section. |
| ⑥ Microscope objective lens | |
| ⑦ Magnification drum lens | |
| ⑧ Eyepiece objective lens | Used to focus the observed image in the eyepiece and to align the optical axis. |
| ⑨ Image erecting prism | Changes the inverted image in the microscope to the erect one and adjusts the rotation centering axis to prevent the image from moving due to the pupillary distance shift. |
| ⑩ Eyepiece | Magnifies the observed image in the microscope and adjusts the diopter to the patient's eye. |
| ⑪ Color temperature conversion filter | |
| ⑫ Barrier filter | By combining with the exciter filter installed to the illumination system, observes and photographs the anterior eye section in fluorescent light. |

## 1-5 Electric Circuit

**For Japan**



**For Export**


SL-D7
Chin rest unit
* Red is not connected among 7 core wires.
CABLE (Bind YEL, GRY and ORG and connect them.)
CABLE (Bind PUR, PIN and LBL and connect them.)
SL-D Base unit
Halogen optical adjustment VR
SW1
30K
J・S SW
SW1
R/L detection SW
SW2
COM
NO
NC
LED2
External fixation target LED
Earphone code
Earphone code
D2
R1
Connector for image taking-in operation To IMAGEnet
Halogen lamp
Volume
External fixation target
Stabilization power supply
DC-1 Power supply (Output 12V/1A)
Pilot LED
LDE1
SW1
F1
F2
CORD1
P51
ORG : Orange
PUR : Purple
PIN : Pink
BRN : Brown
BLU : Blue
YEL : Yellow
GRN : Green
RED : Red
GRY : Gray
LBL : Light blue

# 2. REPAIR GUIDE

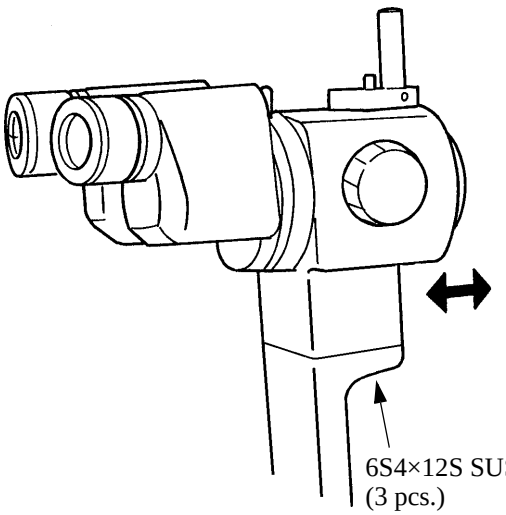
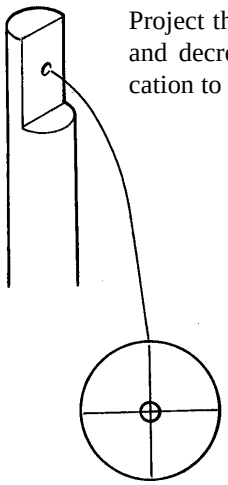
## 2-1 Accuracy Check

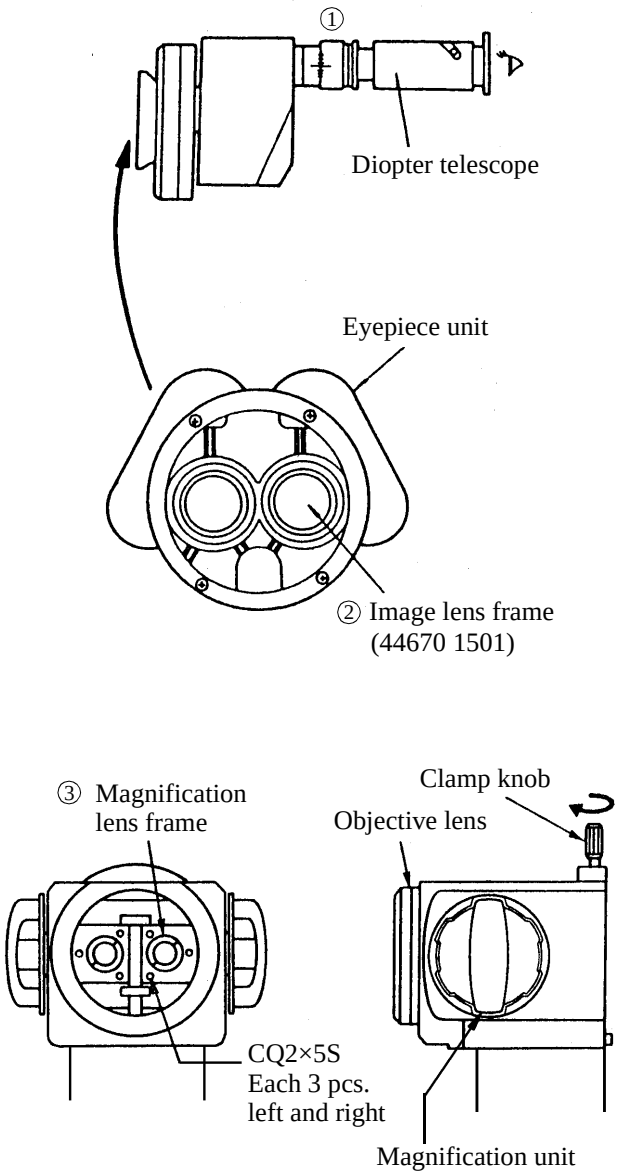
| No. | Item | How to check and allowance | How to adjust and repair | Tools and No. |
|---|---|---|---|---|
| 1 | Same focal point due to magnification | Focus at the maximum magnification and then decrease the magnification in turn, 25×, 16×, 10× and the minimum. Measure the diopter difference at each magnification. | Focuse setting of microscope ..... P. 12 | Diopter telescope [1] |
| 2 | Image shifts when adjusting the pupillary distance. | Place the standard scale on the object. Set the pupillary distance at the minimum and then at the maximum and measure the maximum shift width of the optical axis. [within 0.05mm] | Accuracy setting of pupillary distance prism box ..... P. 15 | Eyepiece with scale [2]<br>Standard scale [3] |
| 3 | The slit width narrows of itself. | Check if the frictional force of handle is too weak to obtain the desired position when changing the slit width. | Adjustment of slit width adjusting force ..... P. 19 | |
| 4 | When releasing the inclination unit, it inclines too quickly. | Check if the slit illumination inclines too quickly when removing the stopper. | Adjustment of inclination unit rotary force ..... P. 16 | |
| 5 | Difference between the aperture and slit image | Measure the difference of the center in the slit open/close direction.<br>[ Aperture ϕ0.2: Within 0.03<br>Aperture ϕ1, ϕ2: Within 0.1 ] | Center setting of aperture and slit image ..... P. 16 | |
| 6 | The slit image shifts due to the slit rotation. | Set the aperture to ϕ0.2. Rotate the slit vertically and then horizontally and measure the maximum shift distance of the slit image on the focusing rod. | Slit image shift setting when rotating the slit ..... P.17 | Eyepiece with scale [2]<br>Standard scale [3] |
| 7 | The slit image is out of focus. | Even after setting the same focal point in the microscope, the slit image is out of focus. | Focus setting of slit image ..... P.17 | |
| 8 | The slit image shifts when rotating the illumination unit horizontally (in 30° right and left each). | Rotate the illumination arm in 30° right and left each and measure the shifting distance of the slit image. [Within 0.1mm] | Slit image shift setting when rotating the slit illumination unit horizontally ..... P.18 | Eyepiece with scale [2]<br>Standard scale [3] |
| 9 | The slit image shifts due to inclination. | Project the slit image on the focusing rod horizontally and incline it. Measure the vertical shifting distance of the slit image. [Within 0.05mm] | Slit image shift setting when inclined ..... P.18 | Eyepiece with scale [2]<br>Standard scale [3] |
| 10 | Trouble of click power of small and large arms | Check the click power by placing the small and large arms at stops on the same line. | Adjustment of click power of small and large arms ..... P.19 | |
| 11 | Inclination of slit image | Project the slit image on the focusing rod and measure its inclination with the eyepiece. [Within 0.24mm at the slit length 14mm] | Adjustment of inclination of slit image ..... P.19 | Eyepiece with scale [2]<br>Focusing rod [4] |

* The width of a line provided on the eyepiece with scale is 0.02mm. When checking the accuracy, use this line as a guideline.

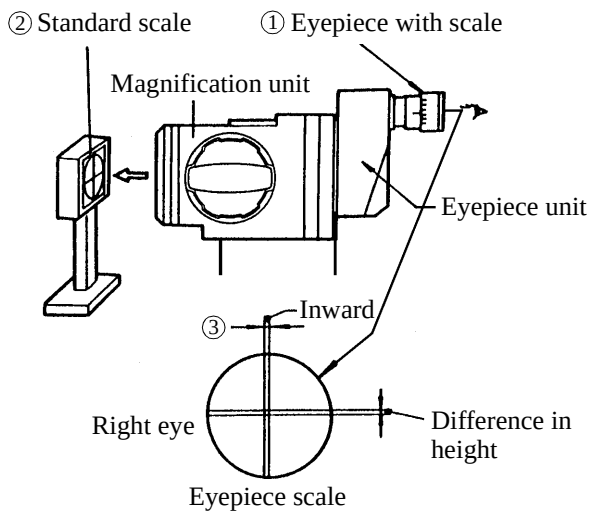
## 2-2 Adjustment

* Before carrying out adjustment, if the screw lock has been applied to a screw, dissolve it using Isoamyl acetate.

| Illustration | Procedure |
|---|---|
|  <br>  <br>Project the image on the focusing rod and decrease the maximum magnification to the minimum.<br><br>Displayed magnification ×: Diopter difference (dpt)<br>25: 0.5<br>16: 0.6<br>10: 0.15<br>(Minimum): 0.35 | **1. Focus setting of microscope**<br>① Loosen the screws 6S4×12S SUS (3 pcs.) fixing the microscope on the arm.<br>② Change magnification as looking into the diopter telescope. Move the microscope back and forth, tighten the screws 6S4×12S SUS where it is in focus and apply the screw lock. |

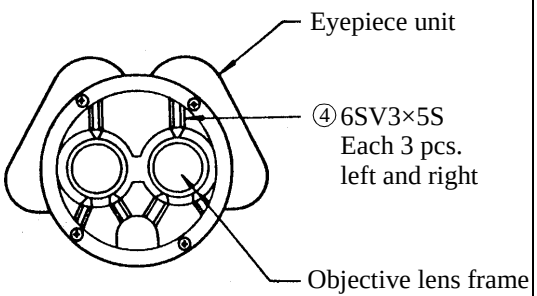
| Illustration | Procedure |
|---|---|
|  | **2. Focusing**<br>When the microscope unit does not well focus and the slit image is not clear<br>(with magnification drum unit at 16×):<br>① Remove the eyepiece unit.<br>Place the diopter telescope and sight a target as far as possible to check for diopter zero setting. The "0" on the diopter adjusting ring should be at the zero marker with 0.5 diopter allowance. If not, correct it.<br>② Put into or put out the image lens frame (44670 1501) so that the finest focus is obtained at the "0" diopter on the scale.<br>After adjustment, apply the screw lock.<br>③ Mount the eyepiece unit on the magnification unit.<br>Turn the magnification unit clamp knob clockwise to couple the eyepiece unit with the magnification unit, and then set the magnification drum at 25.6×. Focus each unit by moving the magnification lens frame (44670 1016) forward and backward.<br>④ Apply the screw lock after focusing. |

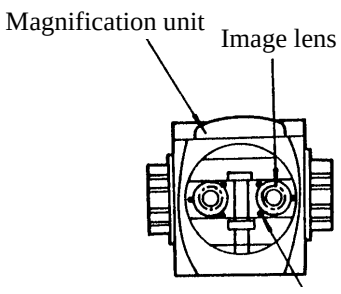
| Illustration | Procedure |
|---|---|




Optical axis parallelism between left and right

| Direction | Optical axis parallelism | Material dimensional conversion (mm) | | | | |
|---|---|---|---|---|---|---|
| | | 6× | 10× | 16× | 25× | 40× |
| High and low | Within 20' | Within 0.24 | Within 0.15 | Within 0.09 | Within 0.06 | Within 0.04 |
| Inward | 50' ±25' | 0.59 ±0.29 | 0.36 ±0.18 | 0.23 ±0.11 | 0.14 ±0.07 | 0.09 ±0.04 |




**3. Optical axis setting**

① Put the eyepiece with scale on the eyepiece unit and turn the diopter adjusting ring to adjust diopter.

② Project a slit as narrow as possible (length: 9mm) on the standard scale.

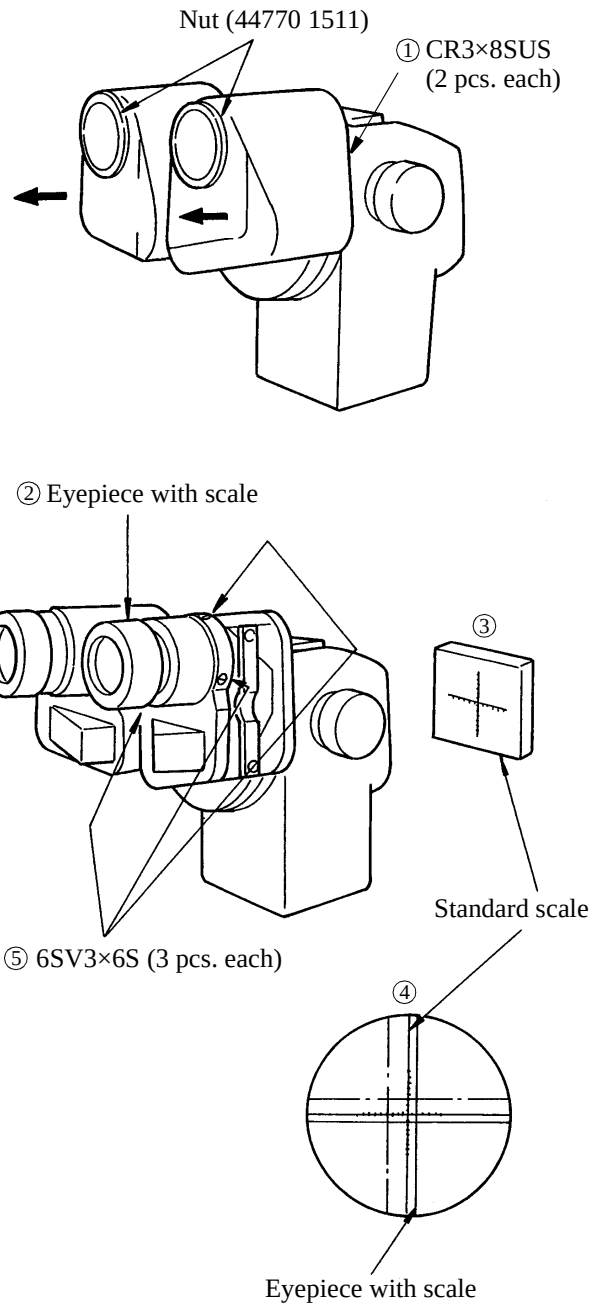
③ Judge which is wrong, the magnification unit or eyepiece unit.
Set the magnification unit at 16× where no lens is set. Then, check the difference of images between when placing the slit vertically and horizontally to determine that the eyepiece is correctly adjusted.

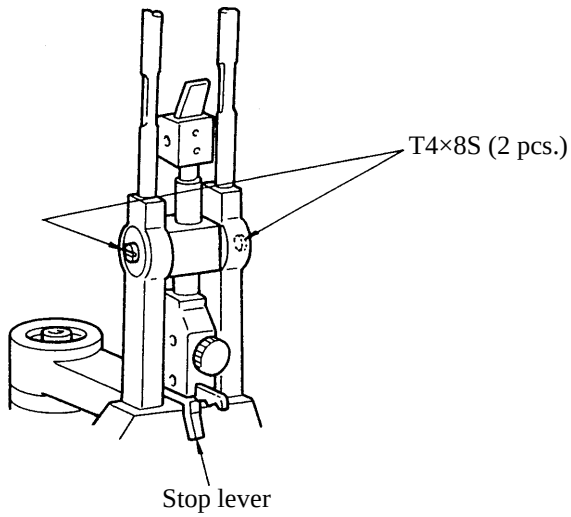
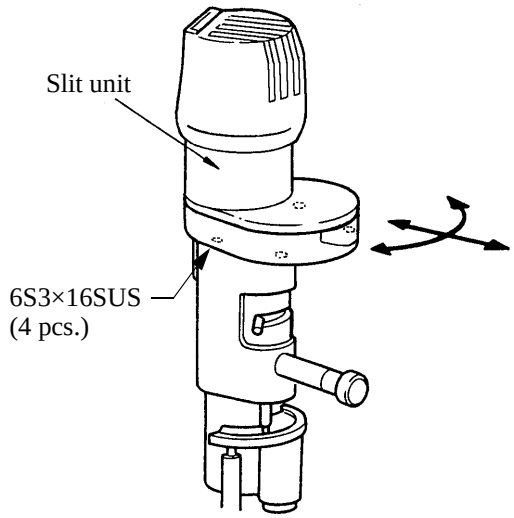
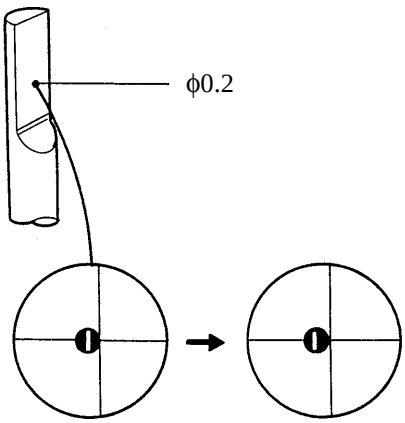
Difference
- Optical axis:
  Difference in height: Within ±0.04mm
  Difference in height between left and right: Within 0.045mm
- Inward difference
  Inward slant: Within 0.15mm
  Inward slant between left and right: Within 0.23mm

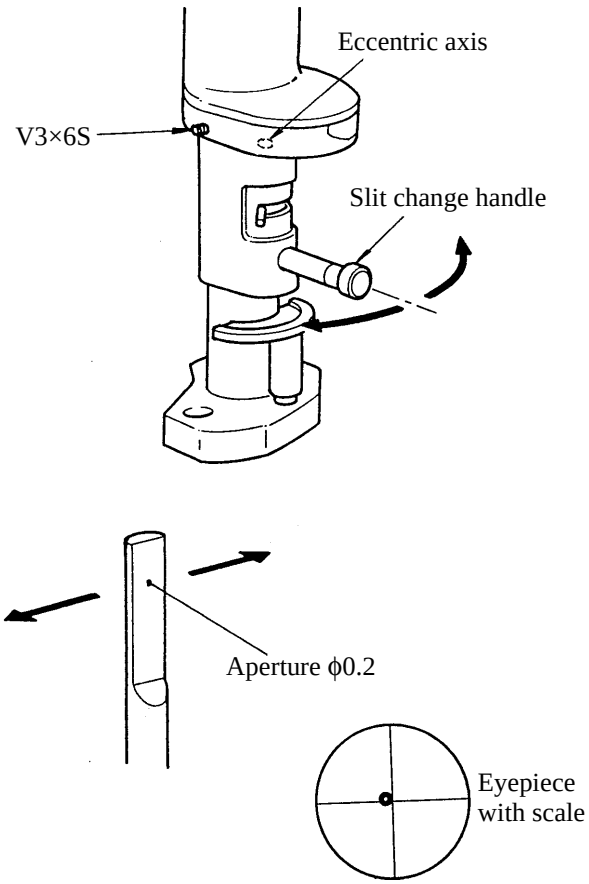
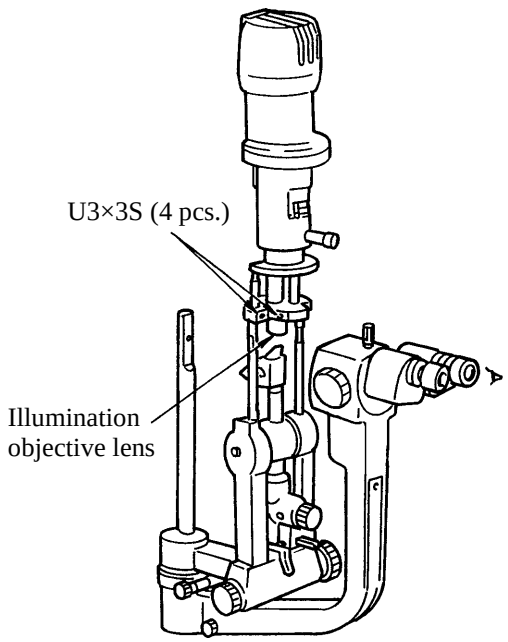
④ When something is wrong with the eyepiece unit:
Use the 6SV3×5S, 3 pcs. each on left and right sides, to move the objective lens frame (44670 1501) and adjust the difference within the standard.
After adjustment, tighten the screws well and apply the screw lock.

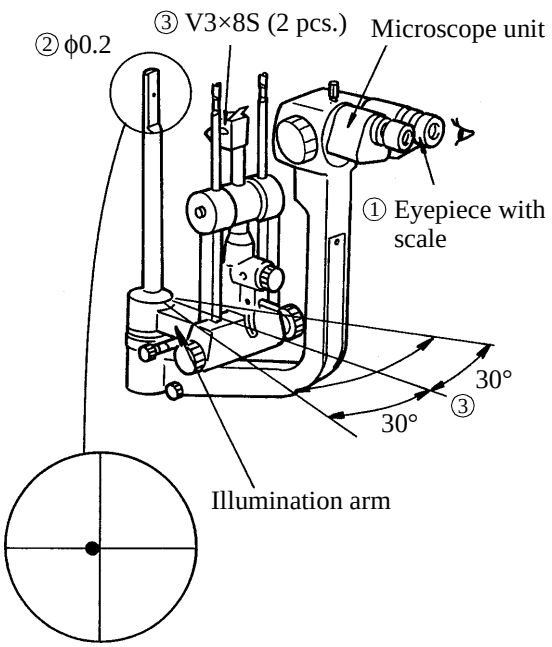
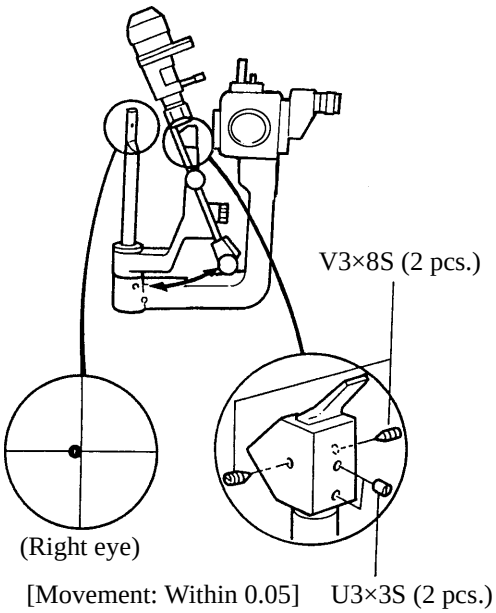
⑤ When the eyepiece unit is normal:
Set the magnification unit at 40× and 25.6× and give the same checks in ③ above.
See the table at left for the difference levels.

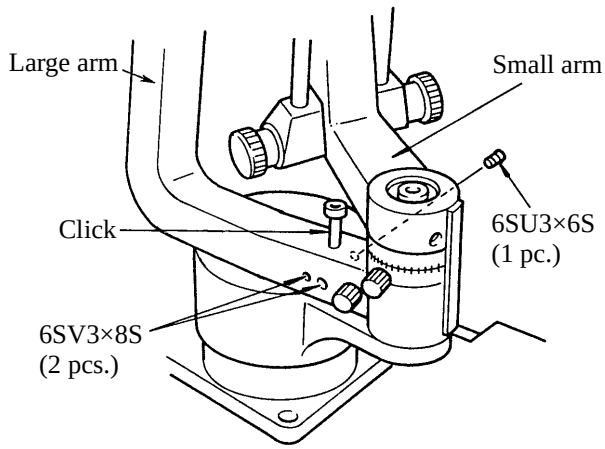
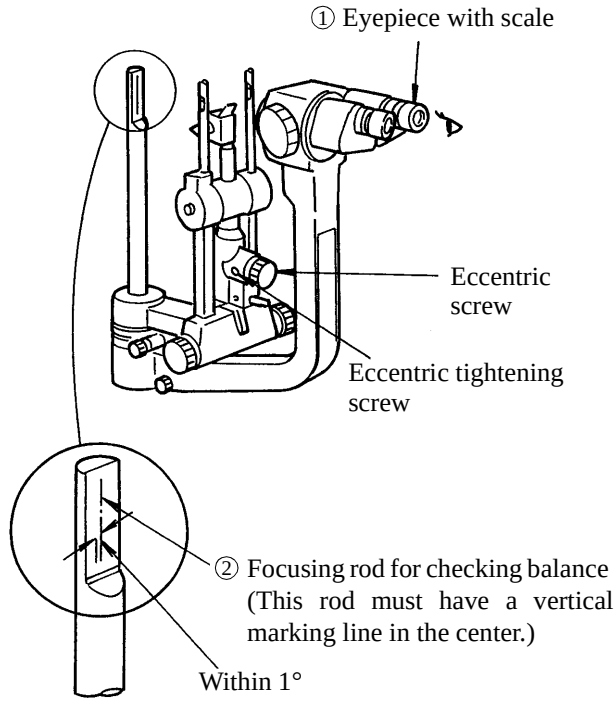
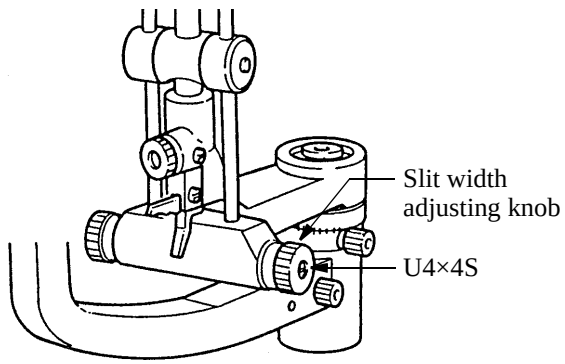
⑥ When something is wrong with the magnification unit:
Move the image lens frames (44670 1013, 44670 1016) with each 3 pcs. of CQ2×5S at 40× and 25.6× to be within the standard.
After adjustment, tighten the screws well and apply the screw lock.

| Illustration | Procedure |
|---|---|
|  <br>[Image shift: Within 0.05mm] | **4. Accuracy setting of pupillary distance prism box**<br>① Remove the nuts (44770 1511), loosen the screws CR3×8SUS (2 pcs. each) and remove the covers (44770 1503, 44770 1504).<br>② Put the eyepiece with scale into the microscope unit.<br>③ Bring the standard scale to the front focal point of the microscope unit.<br>④ Adjust the eyepiece with scale and then move the pupillary distance prism box from the minimum to the maximum to check the difference from the standard scale.<br>⑤ Move the eyepiece holder (44670 1521) with the screws 6SV3×6S (3 pcs. each) until the image does not move even when moving the pupillary distance prism box from the minimum to the maximum (in both right and left).<br>⑥ Tighten the screws 6SV3×6S (3 pcs. each) fully after setting the accuracy. |

| Illustration | Procedure |
|---|---|
|  <br>[1.000~1.400g] | **5. Adjustment of inclination unit rotary force**<br>Release the inclination stop lever and incline the illumination unit. If the illumination unit falls by itself while the stop lever is not applied to the stopper, make adjustment with the screws T4×8S (2 pcs.) on both sides of the rotary unit for the proper weight and tighten them. |
|  <br>  <br>[ Aperture ϕ0.2: Within 0.03<br>Aperture ϕ1, ϕ2: Within 0.1 ] | **6. Center setting of aperture and slit image**<br>When the slit does not close evenly from the periphery toward the center at aperture ϕ0.2:<br>① Put the eyepiece with scale into the microscope unit and adjust the diopter with the dipoter adjusting ring.<br>② Project the slit size of ϕ0.2 on the focusing rod.<br>③ Check the amount of off-center by moving the slit change handle.<br>④ Loosen the screws 6S3×16SUS (4 pcs.) and make adjustment by moving the slit unit right and left or up and down.<br>⑤ Tighten the screws fully after adjustment.<br><br>* The above adjustment should be accompanied with Procedure 7 in the next page. |

| Illustration | Procedure |
|---|---|
|  <br>[Amount of movement: Within 0.1mm] | **7. Slit image shift setting when rotating the slit**<br>When the rotational center of ϕ0.2 moves if the aperture of ϕ0.2 is projected on the slit rod screen and the slit change handle is moved:<br>① Put the eyepiece with scale into the microscope unit and adjust the diopter with the diopter adjusting ring.<br>② Project the aperture of ϕ0.2 on the focusing rod.<br>③ Check the amount of movement by turning the slit change handle in 180°.<br>④ Adjust the eccentric axis (44630 2529) to effect "0" in up and down and "0.1" in right and left by loosening the screw V3×6S on the head of the aperture/filter unit.<br><br>* The above adjustment should be accompanied with Procedure 6 in the previous page. |
|  | **8. Focus setting of slit image**<br>① Adjust the diopter of the microscope unit with the diopter adjusting ring.<br>② Project the aperture of ϕ14 on the focusing rod.<br>③ Loosen the screws U3×3S (4 pcs.) and set the focus by moving the illumination objective lens frame in and out.<br>④ After focusing, tighten the screws U3×3S (4 pcs.) fully and then apply the screw lock. |

| Illustration | Procedure |
|---|---|
|  | **9. Slit image shift setting when rotating the slit illumination unit horizontally (in 30° right and left each)**<br>① Put the eyepiece with scale into the microscope unit and adjust the diopter with the diopter adjusting ring.<br>② Project the aperture of ϕ0.2 on the focusing rod.<br>③ Watch the deviation as moving the illumination arm in 30° right and left and, after loosening the screws V3×8S (2 pcs.) of the mirror bracket, adjust to keep the right and left movement within 0.1.<br>④ After adjustment, tighten the screws fully and apply the screw lock. |
|  | **10. Slit image shift setting when inclined**<br>① Put the eyepiece with scale into the microscope unit and adjust the diopter with the diopter adjusting ring.<br>② Project the aperture of ϕ0.2 on the focusing rod.<br>③ Watch the amount of movement as moving the inclination unit as shown by the arrow.<br>④ Make adjustment with the screws V3×8S (2 pcs.) and U3×3S (2 pcs.) of the mirror bracket. |

| Illustration | Procedure |
|---|---|
|  | **11. Adjustment of click power of small and large arms**<br>Adjust the click power for the proper weight with the screws 6SV3×8S (2 pcs.) and 6SU3×6S (1 pc.) and then tighten them fully.<br><br>* When the illumination arm is rotated, the click stop should be firmly sensed and it should be possible to prevent the microscope arm from rotating. |
|  <br>[Within 0.14mm at the slit length 8mm] | **12. Adjustment of inclination of slit image**<br>① Put the eyepiece with scale into the microscope unit and adjust the diopter with the diopter adjusting ring.<br>② Project the slit image after inserting the focusing rod for checking balance.<br>(Project the slit image as narrow as possible to obtain the maximum length.)<br>③ Loosen the eccentric tightening screw (6SU5×6SUS). Adjust the inclination to be within 1° with the eccentric screw (44670 3513). After adjustment, apply the screw lock. |
|  <br>[When slit widens: 200~700g<br>When slit narrows: 100~300g] | **13. Adjustment of slit width adjusting force**<br>When the slit width adjusting knob operation becomes too light and slit narrows the width by itself, adjust it by tightening the screw (U4×4S) in the center of slit width adjusting knob on the right. |

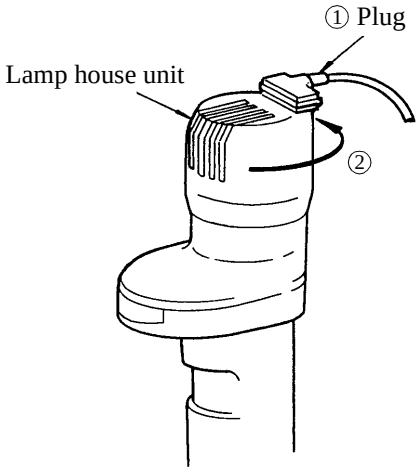
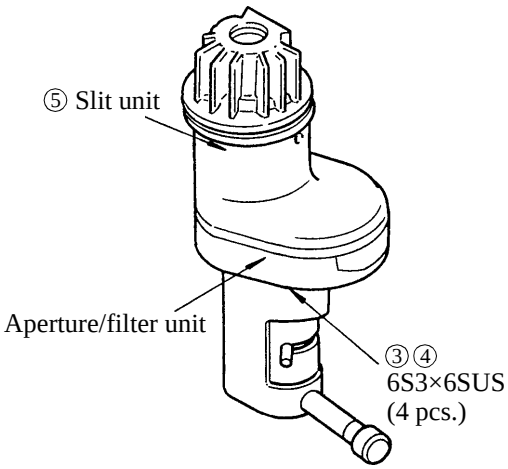
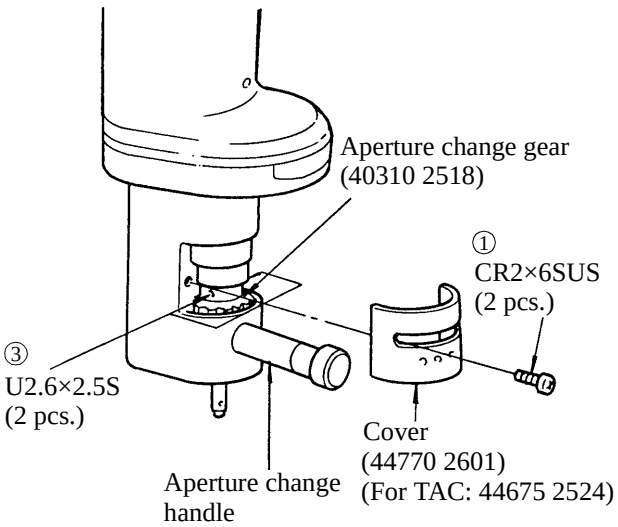
## 2-3 Repairing Order

**Precautions for repairs**

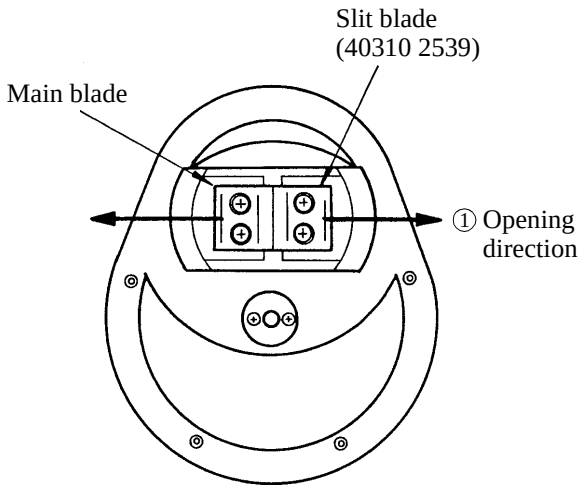
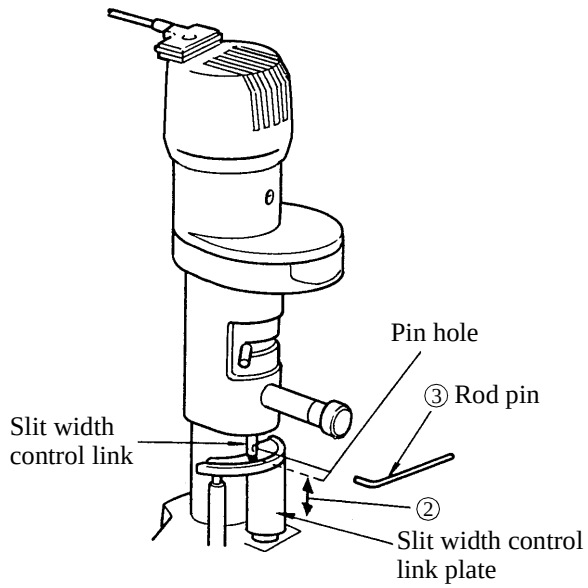
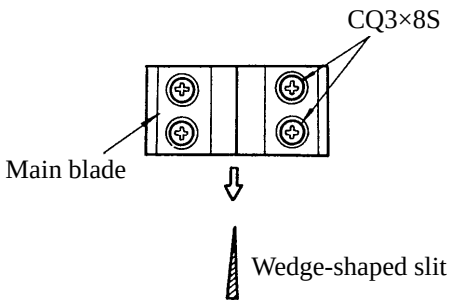
1. The following sections describe the disassembly and assembly of units.
   For correctly repairing these components, a wide experience in assembly and adjustment of medical equipment is required. Only suitably qualified persons should carry out the following work.
2. The special tools for repair are as follows:
   - White whetstone for slit
   - Slit holder tool

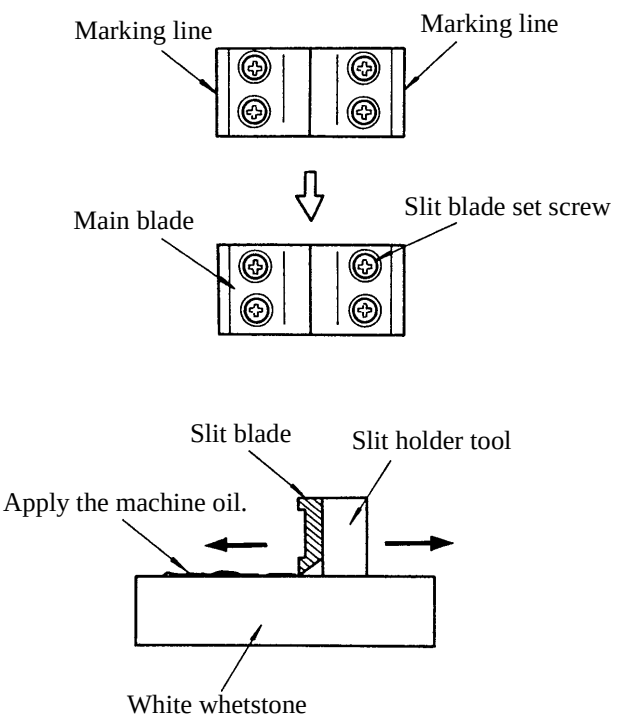
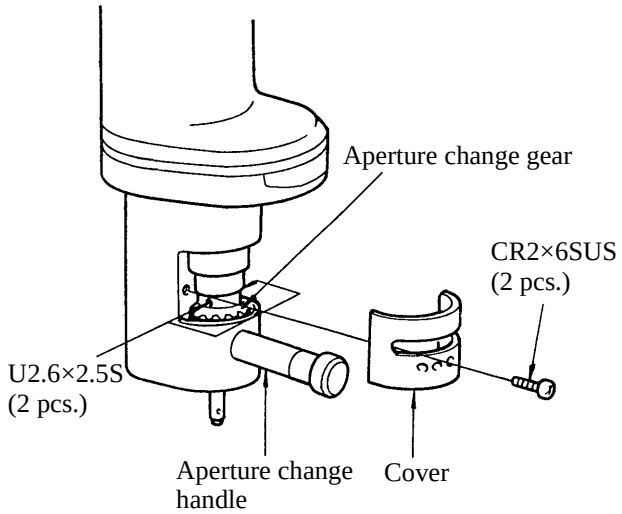
   If these tools are required, order them from TOPCON.
3. Before loosening screws, if the screw lock has been applied to them, dissolve it using Isoamyl acetate.
   When retightening them after repair, apply the fresh screw lock.

## 2-3-1 Disassembly and assembly of illumination unit

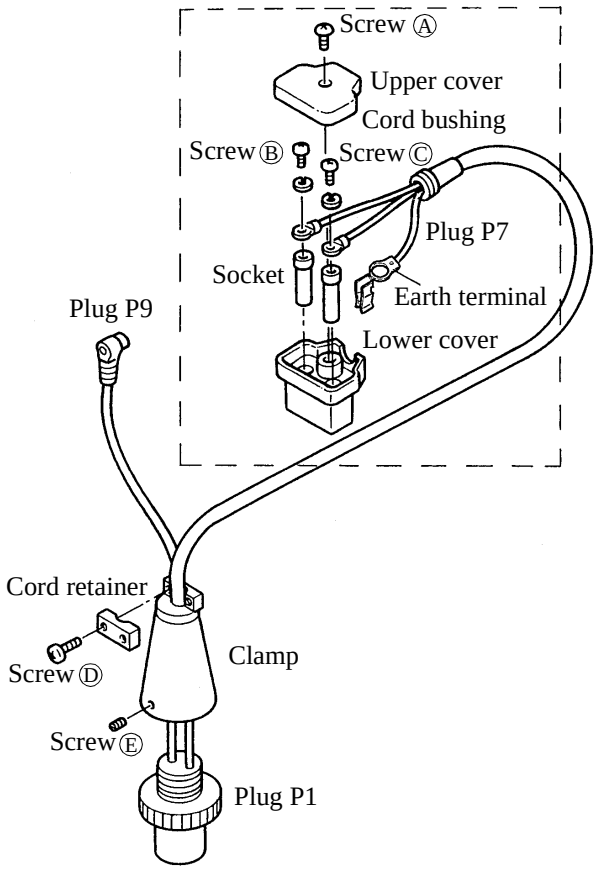
| Illustration | Procedure |
|---|---|
|  | **1. Removing the slit unit**<br>① Disconnect the plug of the lamp house.<br>② Remove the lamp house by turning in the arrow direction.<br>③ Apply the amyl solvent to the top of the screw.<br>④ Remove the screws 6S3×16SUS (4 pcs.).<br>⑤ Remove the slit unit by pulling up. |
|  | **2. Removing the aperture/filter change lever unit**<br>① Remove the screws CR2×6SUS (2 pcs.).<br>② Remove the filter handle cover (44770 2601).<br>* For TAC (44675 2524)<br>③ Loosen the screws U2.6×2.5S (2 pcs.). |
|  | |

**Important points for assembly**

| Illustration | Points |
|---|---|
|  <br>  <br>  | **1. When the slit does not close:**<br>The slit must always close on the screen of the focusing rod. If not, check the slit unit for dust or foreign matters. If there is no dust or a foreign matter, carry out as follows.<br>① Make sure that the slit blade spring works correctly.<br>(Move it in the opening direction by hand right and left.)<br>② Make sure that the slit width control link spring works correctly.<br>(Move the slit width control link up and down with your finger.)<br>③ Make sure that the slit width control link is tightly connected with the plate. If not, move the link up and down by turning the rod pin for adjustment.<br>④ In case of the wedge-shaped slit blade, (after applying the amyl solvent to the top of the screws for dissolving the screw lock,) adjust it by loosening the screws CQ3×8S (2 pcs.) a little against the main blade to close completely. |

| Illustration | Points |
|---|---|
|  | ⑤ In case of the broken slit blade:<br>(a) Make a marking line before disassembly to set the slit blade into the original position.<br>(b) Remove the slit blade set screws.<br>(c) First, whet the main blade. (Refer to the illustration on the previous page.)<br>* Place the slit blade on the slit holder tool perpendicularly and evenly and whet it uniformly and horizontally. After whetting, remove burrs. When removing burrs, be careful not to damage the slit edge and scoop only the burred part lightly by hand. After whetting, wipe off the machine oil with ether and apply it thinly to the whetstone again. |
|  | **2. Stiffness and unevenness of the aperture/slit change handle**<br>If the aperture change handle has stiffness, unevenness or play, remove the screws CR2×6SUS (2 pcs.), remove the cover (44770 2601), loosen the set screws U2.6×2.5S (2 pcs.) of the aperture change gear (40310 2518) and adjust the tooth clearance to move smoothly. |

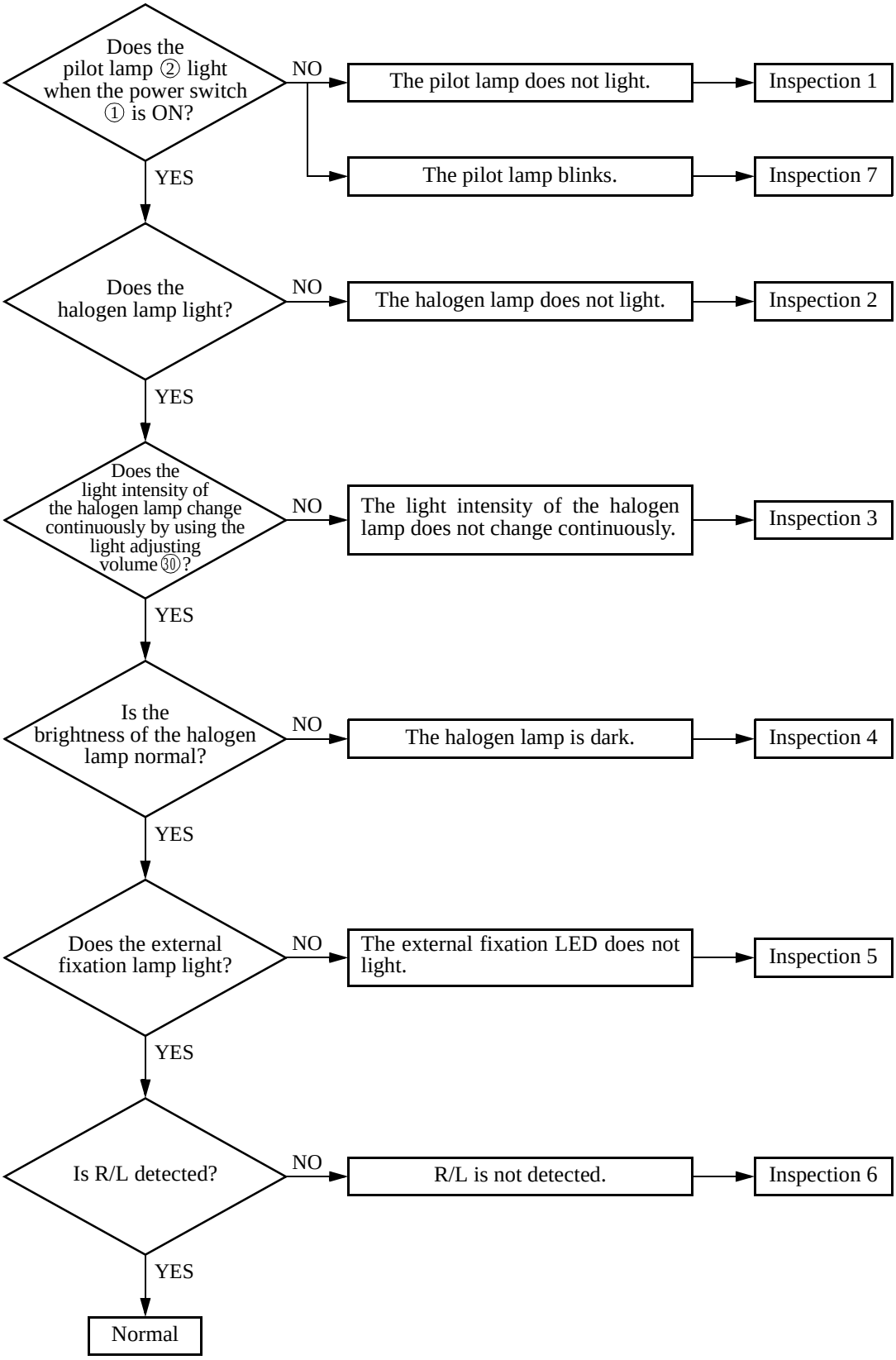
## 2-3-2 Disassembly and assembly of power supply unit

| Illustration | Procedure |
|---|---|
|  | **1. Removing the plug P7**<br>① Remove the screw Ⓐ.<br>② Remove the upper and lower covers.<br>③ Remove the screws Ⓑ and Ⓒ and then remove the socket.<br><br>**2. Removing the plug P1**<br>① Remove the two screws Ⓓ.<br>② Remove the screw Ⓔ.<br>③ Remove the clamp from the plug by turning.<br>④ Remove the cords.<br>* For TE, the earth terminal is prepared. |

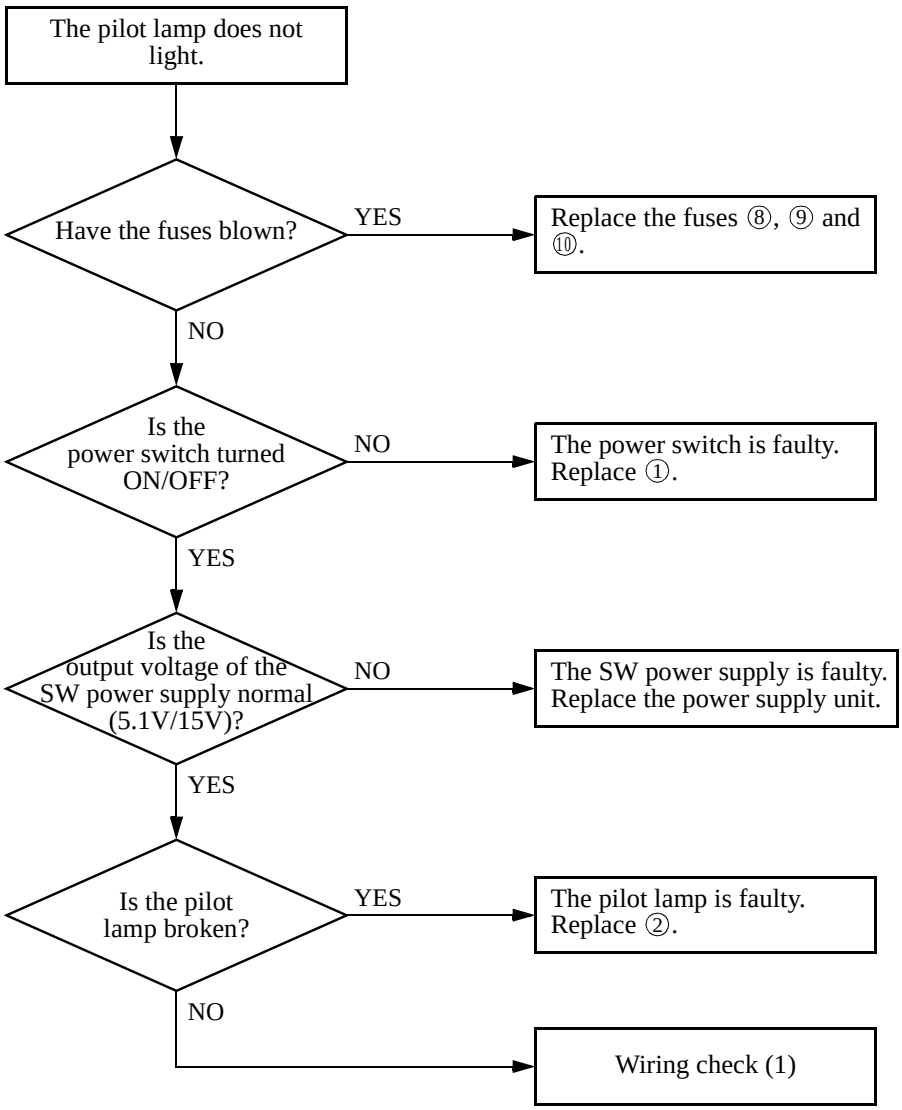
### 2-3-3 Trouble shooting (Main body)

| No. | Trouble | Cause | Remedy | Tool | Reference page |
|---|---|---|---|---|---|
| 1 | The slit does not close. | Dust is stuck to the slit. | Wipe off dust with ether many times. | • Eyepiece with scale | P.22, 23 |
| | | The slit is wedge-shaped. | Adjust the slit blade. | • Eyepiece with scale | P.22, 23 |
| 2 | There is a difference between the aperture of ϕ0.2 and the slit center. | The accuracy is not good in the incorporation of the slit unit and illumination unit. | Loosen the slit box tightening screws (4 pcs.) to position them accurately. | • Standard scale<br>• Eyepiece with scale | P.16 |
| 3 | Difference between the slit center and microscope center. | The reflection mirror in the illumination unit is not positioned correctly. | Position the reflection mirror in the illumination unit accurately. | • Standard scale<br>• Eyepiece with scale | P.17, 18 |

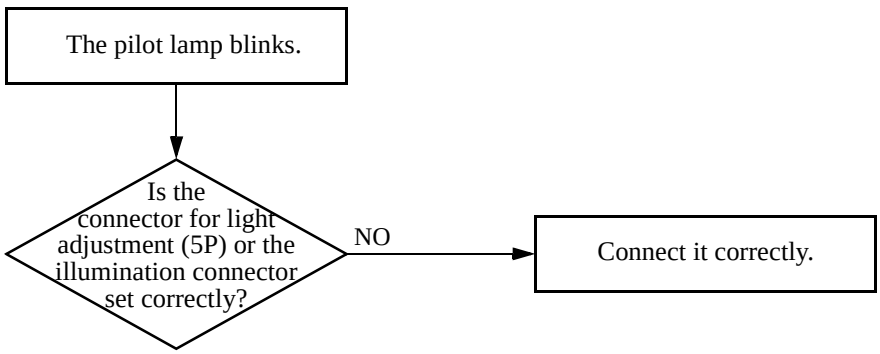
## 2-3-4 Trouble shooting (Power supply unit)



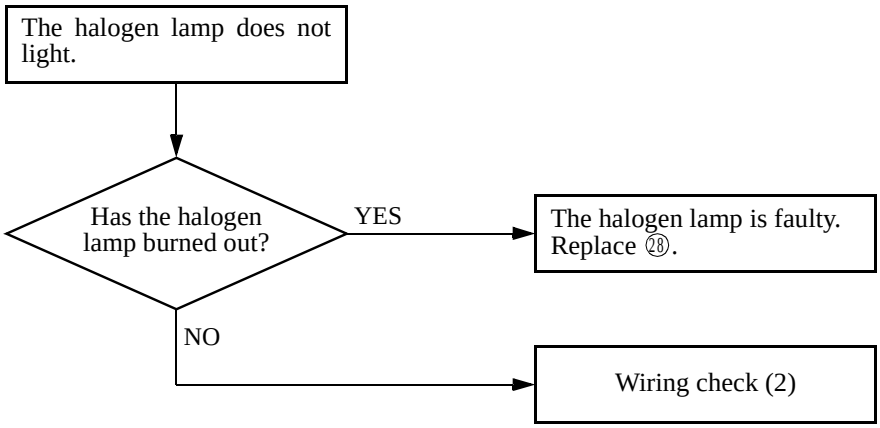
| Inspection 1 | Inspection Procedure | Inspection Details |
|---|---|---|



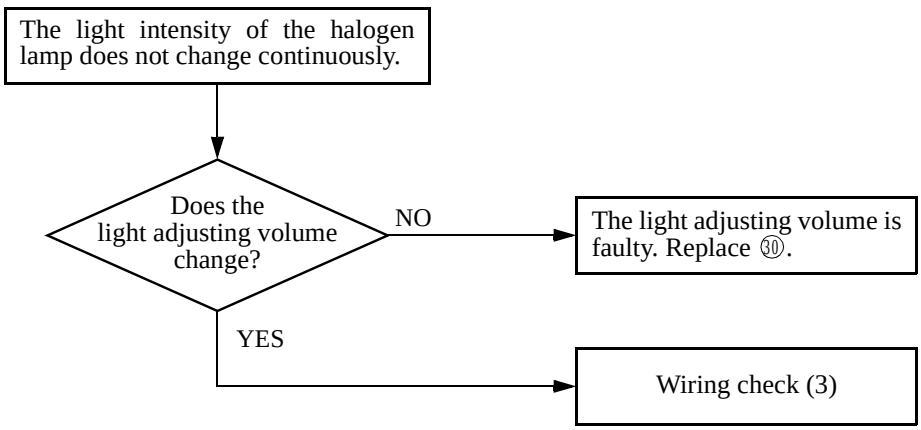

| Inspection 7 | Inspection Procedure | Inspection Details |
|---|---|---|



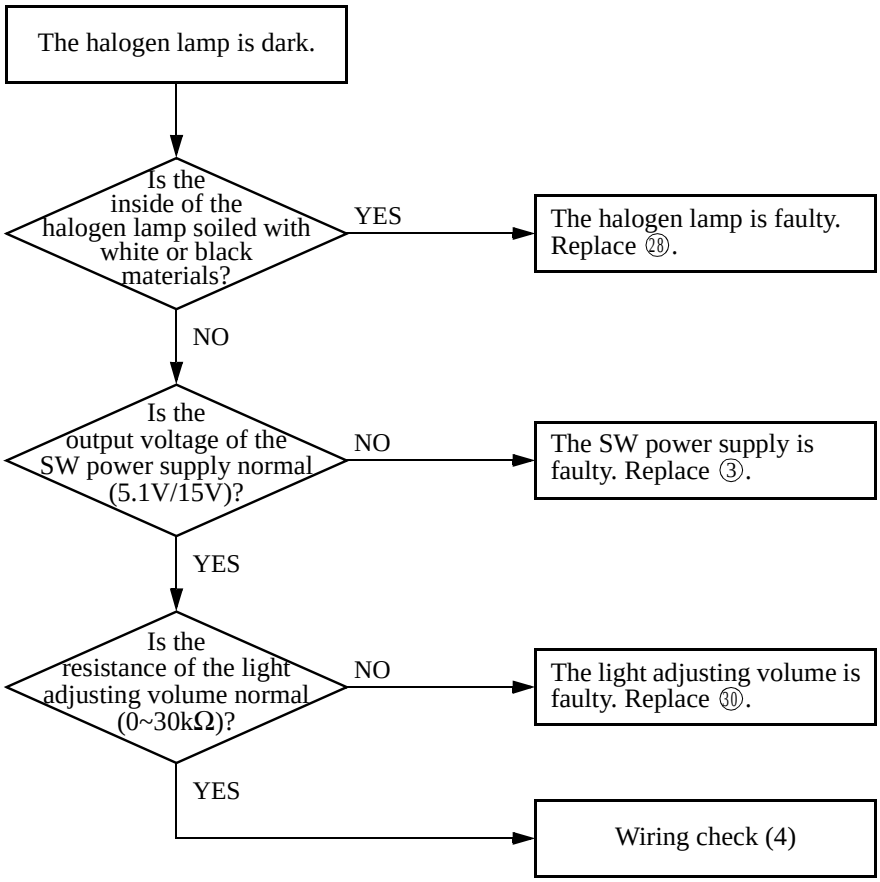
| Inspection 2 | Inspection Procedure | Inspection Details |
|---|---|---|



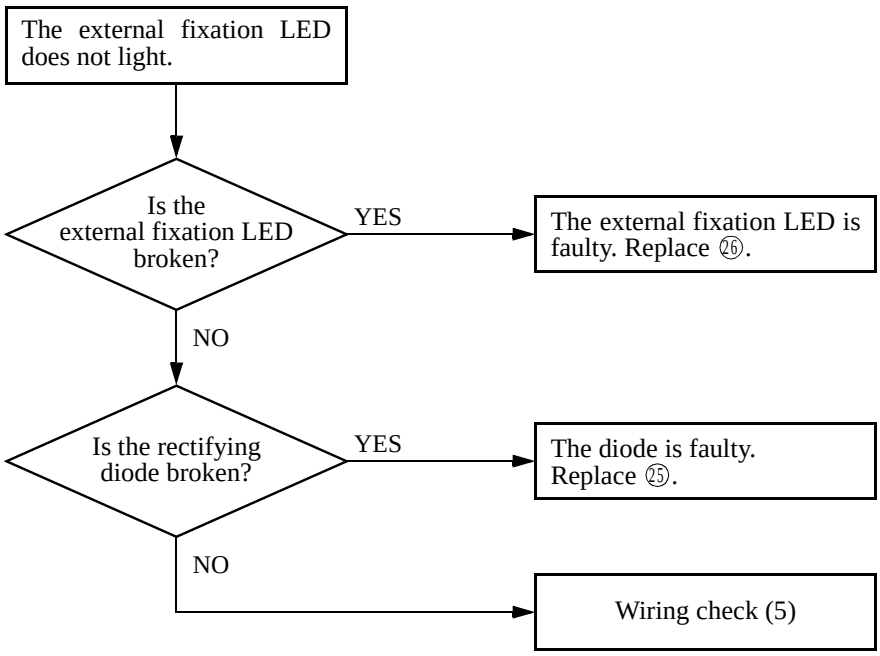

| Inspection 3 | Inspection Procedure | Inspection Details |
|---|---|---|



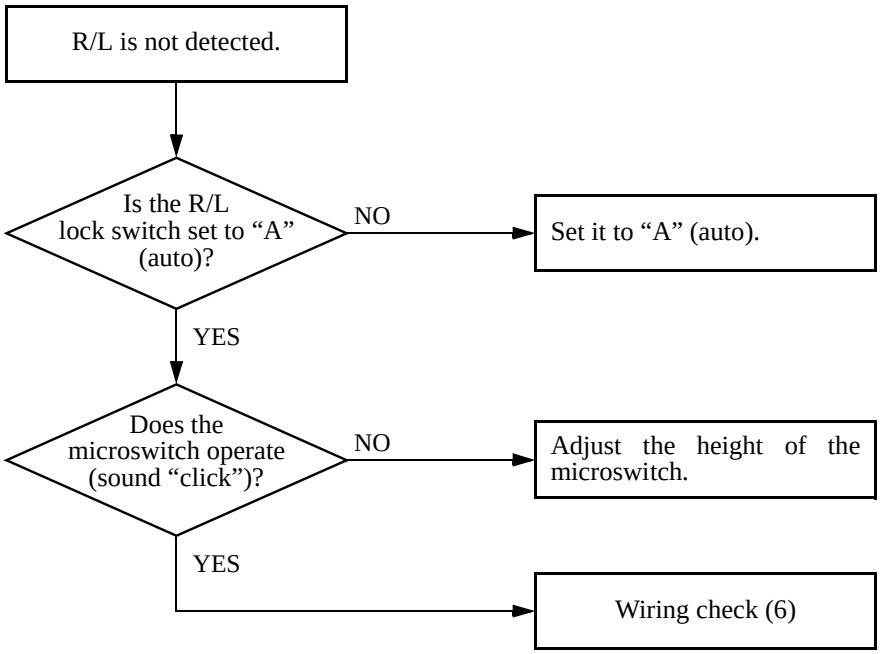
| Inspection 4 | Inspection Procedure | Inspection Details |
|---|---|---|




| Inspection 5 | Inspection Procedure | Inspection Details |
|---|---|---|



| Inspection 6 | Inspection Procedure | Inspection Details |
|---|---|---|



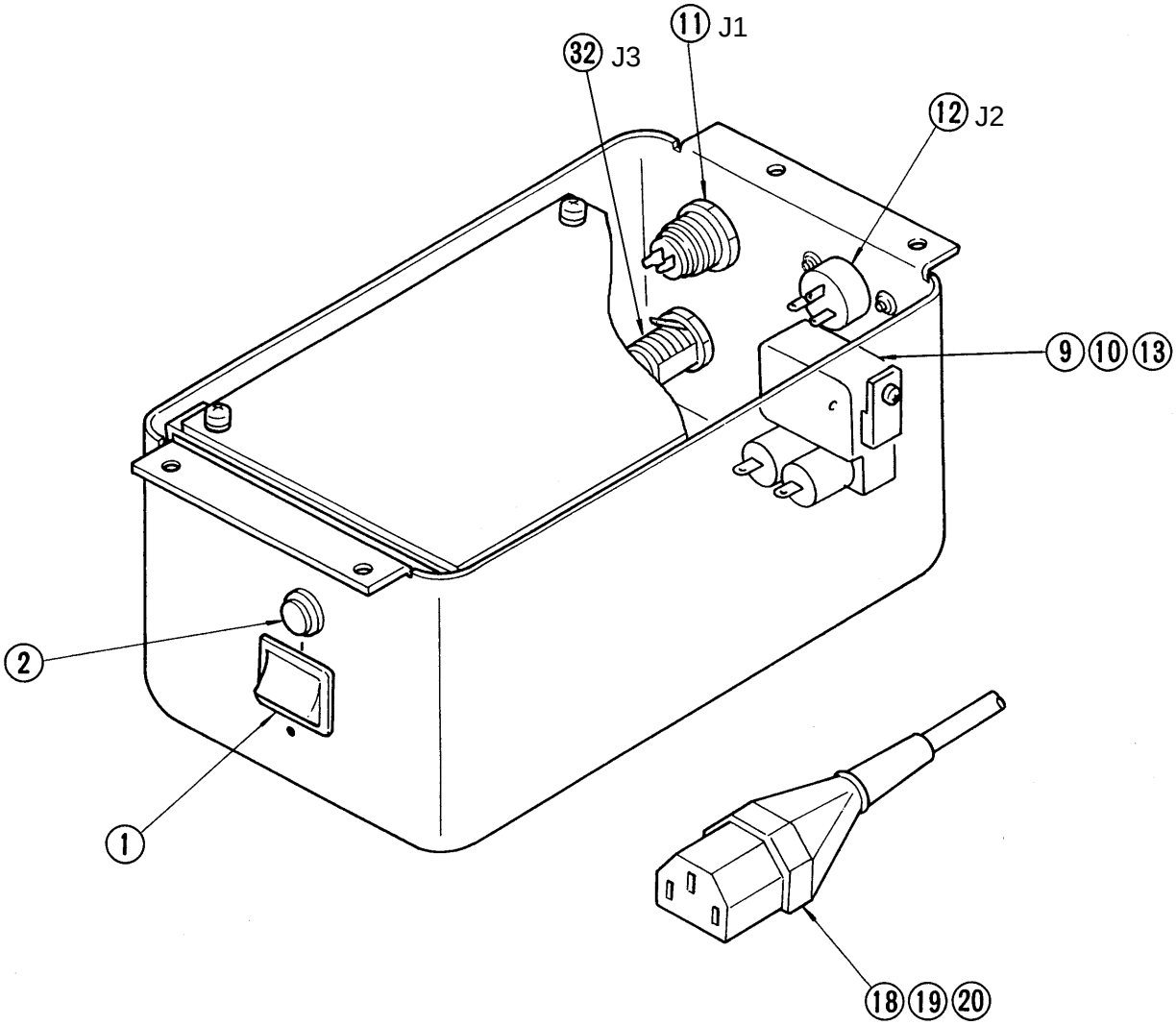
## 2-3-5 Wiring check

This section describes the special checks that are required when the problem is diagnosed as “Wiring check” in the frowcharts of “2-3-4 Trouble shooting”. The number in parentheses for the wiring check in “2-3-4 Trouble shooting” corresponds to “No.” in the following table.
Use the tester to check between “From” and “To” in “Area for checking”.
If the wire passes through a part on the way, such a part is shown in “Via”.
Check it at the same time. Refer to “Electric parts arrangement”.

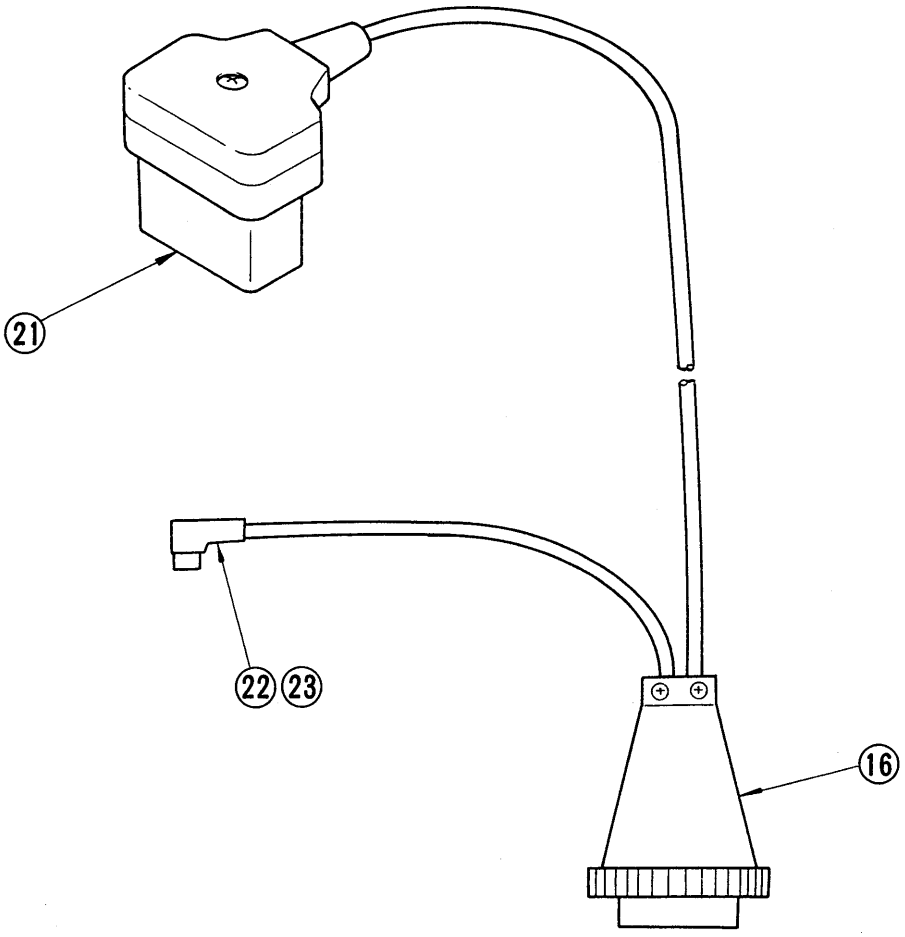
| No. | Remarks | Area for checking | | |
|---|---|---|---|---|
| | | From | Via | To |
| (1) | Disconnection | Inlet (L) | Fuse holder (F1) ~ Power switch (SW1) | SW power supply (P1-3) |
| | | Inlet (N) | Fuse holder (F2) ~ Power switch (SW1) | SW power supply (P1-1) |
| | | Connector (P52-1) | —— | Pilot lamp (P.L) |
| | | Connector (P52-2) | —— | Pilot lamp (P.L) |
| (2) | Disconnection/ Short circuit | Connector (P2-1) | —— | Halogen lamp (H.L) |
| | | Connector (P2-2) | —— | Halogen lamp (H.L) |
| | | Connector (J1-3) | Connector (P2-3~P1-1) | Volume (CN1-1) |
| | | Connector (J1-4) | Connector (P2-4~P1-2) | Volume (CN1-2) |
| | | Connector (J1-5) | Connector (P2-5~P1-3) | Volume (CN1-3) |
| (3) | Disconnection/ Short circuit | Connector (J1-3) | Connector (P2-3~P1-1) | Volume (CN1-1) |
| | | Connector (J1-4) | Connector (P2-4~P1-2) | Volume (CN1-2) |
| | | Connector (J1-5) | Connector (P2-5~P1-3) | Volume (CN1-3) |
| (4) | Disconnection/ Short circuit | Same as Wiring check (2). | | |
| (5) | Disconnection | Connector (P2-1) | Diode (D2) | External fixation LED (LED2-A) |
| | | Connector (P2-3) | Resistor (R1) | External fixation LED (LED2-K) |
| (6) | Disconnection | Connector (CN2-4) | —— | Switch (SW2-4) |
| | | Connector (CN2-8) | —— | Switch (SW2-3) |

## 2-3-6 Electric parts arrangement

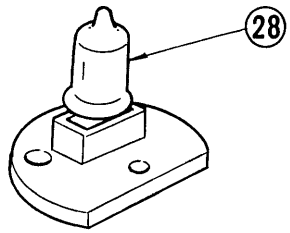
(1) PS-70/PS-70A/PS-70E Power supply
* PS-70E (for TE) is equipped with the insulation plate and fireproof plate.

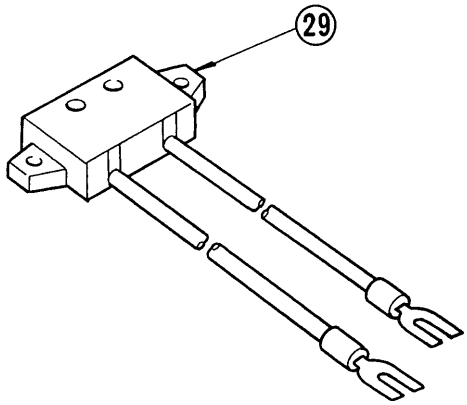


(2) Halogen lamp cord

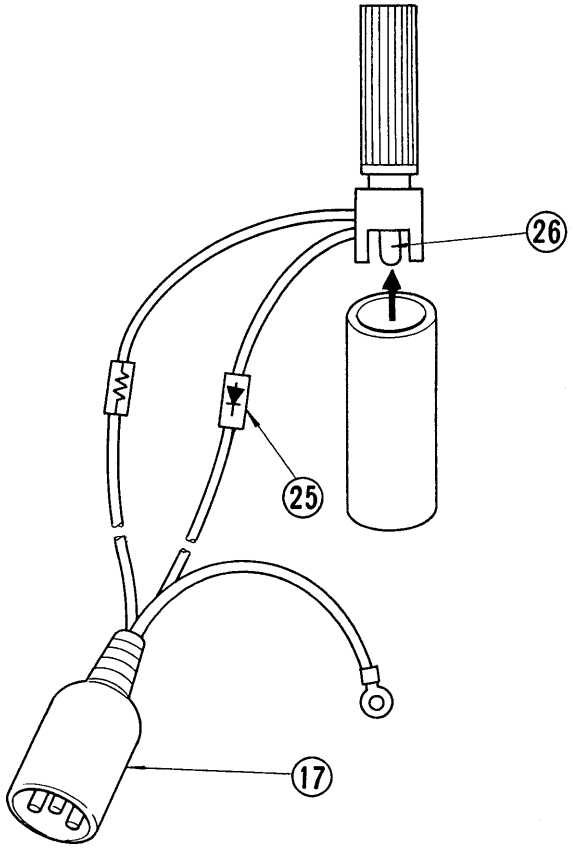


(3) Halogen lamp and socket

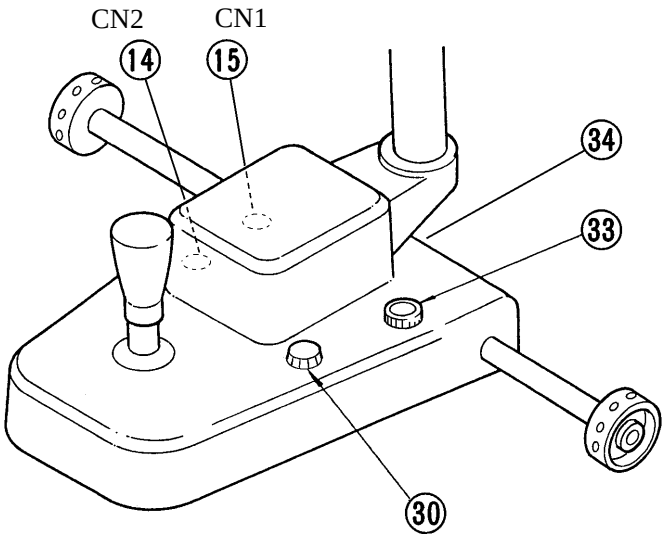


(4) External fixation target




(5) Cross slide unit

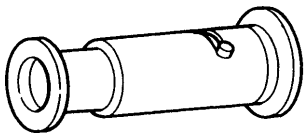
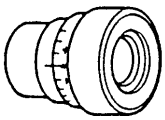
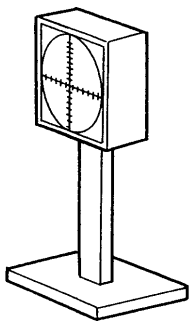


## 2-3-7 List of electric part numbers

| No. | Part name | Symbol | Order No. | Rating | Remarks |
|---|---|---|---|---|---|
| ① | Power switch | SW1 | 44770 60520 | SF-W201A-30BB (Echo Denshi) | |
| ② | Pilot lamp | LED1 | 40416 51260 | DB-1 (Green) (Sato Parts) | |
| ⑨ | Fuse | F1, F2 | 44635 60030 | 5TT1 (Bell Fuse) | Japan/TMS |
| ⑩ | Fuse | F1, F2 | 44770 63510 | 5TT750 (Bell Fuse) | TE/TS/General |
| ⑪ | Connector | J1 | 44680 60020 | RM12BRD-6S (Hirose) | |
| ⑫ | Inlet | J2 | 40420 55330 | MAB3 (Harshmann) | |
| ⑬ | Inlet | | 44630 67730 | AP-340 (YAMATE DENKEN) | |
| ⑭ | Receptacle | CN2 | T22000316A | HR12-10R-8SD (Black) (Hirose) | |
| ⑮ | Receptacle | CN1 | 44642 31520 | HR12-10R-5SD (Black) (Hirose) | |
| ⑯ | Plug | P2 | 44680 41520 | RM12BPG-6P (Hirose) | |
| ⑰ | Plug | P3 | 40420 55320 | MAS30 (Harshmann) | |
| ⑱ | Power cord set | | 42364 51100 | (Hanai Densen) | Japan |
| ⑲ | Power cord set | | 44681 65010 | (Hanai Densen) | TMS |
| ⑳ | Power cord set | | 40130 50041 | (Hanai Densen) | TE/TS/General |
| ㉑ | Socket pin | | 44680 41580 | | |
| ㉓ | Plug | P1 | 44642 41510 | HR10LA5PS600 (Black) (Hirose) | TMS |
| ㉕ | Diode | D2 | 06510 20760 | 1S2076A (Hitachi) | |
| ㉖ | External fixation LED | LED2 | 44670 42060 | HBR5566X (Stanley) | |
| ㉘ | Halogen lamp | H.L | 44680 25700 | (LIFEEREX) | 12V 30W |
| ㉙ | Halogen lamp socket | (H.L) | 44680 25900 | 990/245 (BENDA & BIRUTS) | |
| ㉚ | Light adjusting volume | VR1 | 44642 31540 | RV16YNB303 (TOCOS) | 30kΩ |
| ㉜ | Connector | J3 | 40414 49100 | HR10A-7R-4S (Hirose) | |
| ㉝ | Switch | SW3 | 44770 38010 | SRRN134300 (Alps Denki) | |
| ㉞ | Microswitch | SW1 | T20000203A | AVL325561 (Matsushita Denki) | |

## 2-4 List of Repair Tools

### 2-4-1 List of special repair tools

| Tool No. | Name | Illustration | Function/ accuracy | Application | Remarks |
|---|---|---|---|---|---|
| 1 | Diopter telescope |  | Observation magnification (3.4×) | • Setting the same focus by magnification | |
| 2 | Eyepiece with scale |  | Eyepiece magnification (12.5×)<br>Thickness of scale line (0.02mm) | • Setting the parallelism of the slit image<br>• Slit width change by slit image rotation<br>• Image shift by pupillary distance adjustment | |
| 3 | Standard scale |  | Thickness of scale line (0.02mm)<br>Interval of one graduation (0.1mm) | • Image shift by pupillary distance adjustment<br>• Difference between aperture and slit<br>• Slit image shift by slit rotation<br>• Slit image shift by inclination<br>• Slit image shift when rotating the slit illumination unit horizontally (in 30° right and left each) | |
| 4 | Focusing rod (with vertical marking line) |  | | • Inclination of slit image | |

### 2-4-2 List of general repair tools

- Tester (that can measure voltage, current and resistance)
- Set of six slotted screwdrivers
- Set of four Phillips screwdrivers
- Wooden handle Phillips screwdriver for 3mm
- Hexagonal wrench set
- Radio pliers
- Nippers
- Tweezers
- Soldering iron
- Solder

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